

VECTO

EXECUPLAN™

Primer

E x e c u P l a nTM

**Executive Planning System
and
Interactive Electronic Worksheet**

P r i m e r

**Copyright 1980 Vector Graphic Inc.
All Rights Reserved**

TABLE OF CONTENTS

	<u>Page</u>
SECTION 1	
Introduction	1-1
Conventions	1-2
Getting Started	1-3
SECTION 2	
Modeling	2-1
Sample Model	2-3
Analysis	2-3
Creation	2-6
Saving	2-14
Testing	2-15
Printing	2-16
SECTION 3	
Distribution Disk	3-1
Sample Models	3-2
Forecasting	3-2
FORECAST	3-2
Binomial Expansion	3-4
BINOMIAL	3-4
Real Estate	3-6
PROPDATA	3-6
RENTAL	3-9
Loans	3-12
AMORITIZ	3-12
PAYMENTS	3-14
Error Analysis	3-16
ERRORANL	3-16
Anthropoloy	3-19
ANTHRO	3-19

SECTION 1**Introduction**

Vector Graphic is proud to announce ExecuPlan, the matrix planner that replaces the pencil and paper. You can do estimations, projections - change one variable on the screen and every other figure it affect changes in front of your eyes. Offering unlimited formatting and printing capabilities. There are other calculator/planning systems on the market, but none have the features and offer the flexibility of Vector Graphic's ExecuPlan.

The ExecuPlan Primer has been written with the beginning user in mind. The beginner is guided through the steps necessary in the creation of an ExecuPlan model. A description of the models included on your distribution disk is included. It is the intent of Vector Graphic to give you a easy, yet efficient introduction to the world of ExecuPlan.

Conventions

The following conventions are used in this manual. Underlined text is material that the user types on the keyboard. For example, EPL<return> means the user should type "EPL" and then press the <return> key. Any underlined spaces must also be typed. <control>C means to hold down the CTRL key and press the C key. Other keys may appear in the place of the C. The letter does not have to be shifted (i.e. upper case). <right>arrow means to press the arrow that points to the right.

ExecuPlan may be viewed as a large "electronic worksheet". Every part of the sheet can be individually referenced. The references to the "parts" of the worksheet will be known as elements and the worksheet as an array. Each element of the array may be located in terms of its row and column. This row and column naming convention is known as its address and is written [row,column]. (Think of RC Cola!). Note: the row and column numbers must be separated by a comma.

The bottom line of ExecuPlan is called the command line. It can be identified by the prompt ">". Commands here may be in upper or lower case. If you mis-type at the command line level, you may use the backspace key, <backspace>, to erase the last character typed, or you may use the delete key, , to erase the entire command line. Type H<return> for a quick reference to additional information at the command line level.

Getting Started

In order to use ExecuPlan, the user must first create a CP/M "bootable" disk¹. The files EPL.* and *.EPL must then be copied to the disk². After "booting" the disk, type the following to invoke ExecuPlan:

EPL<return>

The "operating system", CP/M, then loads ExecuPlan. The logo "ExecuPlan" will appear on the terminal. In order to proceed type any character.

You are now in ExecuPlan. ExecuPlan provides you with an initial "worksheet" of 20 rows by 20 columns. The entire 20 by 20 cannot be seen. If you use the "arrows" on the right side of the terminal, you can easily see that the worksheet will move before your eyes! At this point the work sheet is "clean" and has just been initialized. The large bold rectangle, the array cursor, may move across the work sheet. It is located at a particular address. As you move through the empty rows and columns, you will notice that at the top left hand side of the screen is displayed a pair of numbers that identify the cursor address. Very useful "Help Screens" are available to the user. Try typing the following:

?<return>

Displayed on the screen will be a quick "Help Reference Card" and instructions on how to obtain further help. Now type the following:

<return>

and then

H<return>

The "H" help screen gives details on help at the command line level. In other words, it explains the actions of entering information at the bottom of the screen where the prompt ">" is displayed. The help commands have the following format:

HF - Help in setting the Format
HT - Help in setting Titles
etc.

To exit type Q (Quit). You are then prompted with **Exiting - type Y to update file:.** Answer this question with a Y or a N. Please feel free to refer to the "help screens" any time, but remember, they are not the reference manual.

¹ See the CP/M 2 Introductory Manual

² See the CP/M 2 Introduction to Features and Facilities Manual

SECTION 2

Modeling

Before creating a model on ExecuPlan, some "analysis" must first be performed. This analysis will ensure that the model for the application be thoroughly understood. ExecuPlan will not tell you which rows and columns to manipulate. You must first look at the objective. Only after thoroughly understanding the problem should you enter the model. Listed below are the steps necessary to write a model. The first five are known as the analysis and are the most important steps in the modeling procedure.

Objective: Determine what you would like to model.

Presentation: Determine the format of the final product. Whether it is on the terminal screen and/or the printer. What the results should look like as to dollar signs, commas, decimal places, text that should be right justified, etc.

Data: Determine where to acquire every element of data. Also determine from whom the data comes.

Formulas: For calculated results, determine exactly what formulas are needed and what data must be used in each formula. Make sure that all data is available to achieve the desired results. When writing down the formulas, try to make use of the functions that are part of ExecuPlan. Some of the most useful functions are SUM, MIN, MAX, AVG and the trigonometric functions, SIN, COS, and TAN. There are more functions, which are application dependent.

Reevaluate: After going through the first four steps, go back to them again to see if your original objective, presentation, data and formulas are still true. Do this until you feel certain that everything has been accounted for.

Creation: You are now ready to create an ExecuPlan model.

Saving: After creating the model, determine the method of saving the information. This includes the media, (disk, paper, etc.) and the protection status of the information (security). This saving or updating process may be executed a number of times.

Testing: After the initial creation, a series of "saving" and "testing" steps will occur. This is an important step in the process to ensure that the model created is accurate.

Printing: Throughout the "life" of the model, you will require several types of reports. Because of the flexibility of the printing capabilities, the parameters needed for printing need not be initially established. This report is the "product" that is normally presented at meetings, yet one of the easiest to produce.

The remainder of this section references a sample model and leads the user through the steps just mentioned. This sample is identical to the model whose filename is FORECAST and is included on the ExecuPlan distribution disk.

Sample Model

Analysis

Objective: You would like to generate the fiscal year-to-date and the April forecast reports using ExecuPlan. The reports you would like to present at the board meeting have the following formats:

Fiscal Year-to-Date
 First Quarter
 March 31, 1981

Company / Month	January	February	March	Fiscal YTD
Bob's Auto Repair				\$0.00
Cory-O-Graphic				0.00
E. Dilks Inc.				0.00
Celic's Ceramics				0.00
Graphics by Ted				0.00
Livingston's Toys				0.00
Rasmussen's 5 & 10				0.00
Mark's Photo Shop				0.00
Wagner's Liquor				0.00
Zelma's Zoo				0.00
Neale's Meals				0.00
TOTALS:	\$0.00	\$0.00	\$0.00	\$0.00
Change:		\$0.00	\$0.00	
%Change:		0.00%	0.00%	

April Forecast
March 31, 1981

Company / Month	January	February	March	April Proj.
Bob's Auto Repair				\$0.00
Cory-O-Graphic				0.00
E. Dilks Inc.				0.00
Celic's Ceramics				0.00
Graphics by Ted				0.00
Livingston's Toys				0.00
Rasmussen's 5 & 10				0.00
Mark's Photo Shop				0.00
Wagner's Liquor				0.00
Zelma's Zoo				0.00
Neale's Meals				0.00
TOTALS:	\$0.00	\$0.00	\$0.00	\$0.00
Change:		\$0.00	\$0.00	
%Change:		0.00%	0.00%	

Presentation: You would like the reports generated by the model to be exactly like the above. The decimal places and dollar signs should be displayed in the same manner.

Data: The data will come from the following places and people:

There are 11 company names of existing customers. They have been supplied by the sales department.

The data next to each company name for the months of January, February, and March are monthly sales figures that come from the accounting department.

All other data (values) are calculated and require a formula.

Formulas: The columns titled "Fiscal YTD" and "April Proj." are calculated, and the rows titled "TOTALS", "Change" and "%Change" are calculated. The following gives a breakdown for each column and row formula needed for the report.

• **Fiscal YTD** is the sum of January to March. (Use the **SUM** function).

• **April Proj.** is 10% greater than the average for the last three months. (Use the **AVG** function and *****)

• **TOTALS** is the sum from the first company name to the last company name. (Use the **SUM** function)

• **Change** is the current month's **TOTAL** less the last month's **TOTAL**. (Use **"-"**)

• **%Change** is the current **Change** divided by the last month's **TOTAL**. (Use **"/"** and remember to format with percent **"%"** and to 2 decimal places)

Creation

You are now ready to start the creation of an ExecuPlan model.

<u>You</u>	<u>Explanation</u>
Invoke ExecuPlan	
<u>EPL</u> <return>	Load ExecuPlan from CP/M
<u><return></u>	This is the "logo", simply type return to proceed
Determine The Number Of Rows And Columns Needed	
<u>SS 18 6</u> <return>	Set the Size to be 18 rows by 6 columns
	At this time the following message will appear on the screen:
	** Warning: Some rows containing data may be lost - Type Y to proceed -
<u>Y</u>	Type Y
	And again you will see the next message:
	** Warning: Some columns containing data may be lost - Type Y to proceed -
<u>Y</u>	Type Y
Change And/Or Set Up Titles	
<u>TM1 Fiscal Year-To-Date</u> <return>	Set the 1st Main Title to Fiscal-Year-To-Date
<u>TM2 First Quarter</u> <return>	Set the 2nd Main Title to First Quarter
<u>TM3 April Forecast</u> <return>	Set the 3rd Main Title to April Forecast
<u>TM4 March 31, 1981</u> <return>	Set the 4th Main Title to March 31, 1981
<u>OR 1 Comp/Mon</u> <return>	Open a new Row before row 1 and call it Comp/Mon (note: row 18 disappears)
<u>OR 1 =====</u> <return>	Open a new Row before row 1 and call it ===== (note: row 17 disappears)

<u>You</u>	<u>Explanation</u>
<u>TR 12 -111111<return></u>	Change the Title Row from 12 to -111111
<u>TR 13 TOTALS<return></u>	Change the Title Row from 13 to TOTALS
<u>TR 14 Changes<return></u>	Change the Title Row from 14 to Changes
<u>TR 15 Change<return></u>	Change the Title Row from 15 to Change
<u>TR 16 %Change<return></u>	Change the Title Row from 16 to %Changes

Set The Column Widths

<u>WA 12<return></u>	Set the Width of All columns to be 12
<u>W . 20<return></u>	Set the Width of the current (.) column to 20

Fill In The Cosmetics, Such As Extra Titles And Underlines In The Text Area And Format The Rows

<u>FR R<return></u>	Format the current Row to be Right-justified
<u>ET Company / Month <return></u>	Enter the Text Company / Month
<u><right-arrow></u>	Press the right-arrow key to advance to column 2
<u>ET January <return></u>	Enter the Text January
<u><right-arrow></u>	Press the right-arrow key to advance to column 3
<u>ET February <return></u>	Enter the Text February
<u><right-arrow></u>	Press the right-arrow key to advance to column 4
<u>ET March <return></u>	Enter the Text March
<u><right-arrow></u>	Press the right-arrow key to advance to column 5
<u>ET Fiscal YTD <return></u>	Enter the Text Fiscal YTD
<u><right-arrow></u>	Press the right-arrow key to advance to column 6
<u>ET April Proj. <return></u>	Enter the Text April Proj.

<u>You</u>	<u>Explanation</u>
Now position the cursor at [====,1]	
<u>ET =====<return></u>	Enter a Text of 19 ='s
<u><right-arrow></u>	Press the right-arrow key to advance to column 2
<u>ET =====<return></u>	Enter a Text of 11 ='s
<u><right-arrow></u>	Press the right-arrow key to advance to column 3
<u><control-L><return></u>	Repeat the Last command typed
<u><right-arrow></u>	Press the right-arrow key to advance to column 4
<u><control-L><return></u>	Repeat the Last command typed
<u><right-arrow></u>	Press the right-arrow key to advance to column 5
<u><control-L><return></u>	Repeat the Last command typed
<u><right-arrow></u>	Press the right-arrow key to advance to column 6
<u><control-L><return></u>	Repeat the Last command typed
Now position the cursor at [1,1]	
<u>ET Bob's Auto Repair<return></u>	Enter the Text
<u>FR \$2<return></u>	Format Row 1 with dollars signs and to 2 decimal places
<u><down-arrow></u>	Press the down-arrow key to advance to row 2
<u>ET Cory-O-Graphic<return></u>	Enter the Text
<u>FR 2<return></u>	Format Row 2 to 2 decimal places
<u><down-arrow></u>	Press the down-arrow key to advance to row 3
<u>ET E. Dilks Inc.<return></u>	Enter the Text
<u>FR 2<return></u>	Format Row 3 to 2 decimal places

<u>You</u>	<u>Explanation</u>
<u><down-arrow></u> <u>ET Celic's Ceramics<return></u>	Press the down-arrow key to advance to row 4 Enter the Text
<u>FR 2<return></u>	Format Row 4 to 2 decimal places
<u><down-arrow></u> <u>ET Graphics by Ted<return></u>	Press the down-arrow key to advance to row 5 Enter the Text
<u>FR 2<return></u>	Format Row 5 to 2 decimal places
<u><down-arrow></u> <u>ET Livingston's Toys<return></u>	Press the down-arrow key to advance to row 6 Enter the Text
<u>FR 2<return></u>	Format Row 6 to 2 decimal places
<u><down-arrow></u> <u>ET Rasmussen's 5 & 10<return></u>	Press the down-arrow key to advance to row 7 Enter the Text
<u>FR 2<return></u>	Format Row 7 to 2 decimal places
<u><down-arrow></u> <u>ET Mark's Photo Shop<return></u>	Press the down-arrow key to advance to row 8 Enter the Text
<u>FR 2<return></u>	Format Row 8 to 2 decimal places
<u><down-arrow></u> <u>ET Wagner's Liquor<return></u>	Press the down-arrow key to advance to row 9 Enter the Text
<u>FR 2<return></u>	Format Row 10 to 2 decimal places
<u><down-arrow></u> <u>ET Zelma's Zoo<return></u>	Press the down-arrow key to advance to row 10 Enter the Text

<u>You</u>	<u>Explanation</u>
<u>FR 2<return></u>	Format Row 11 to 2 decimal places
<u><down-arrow></u>	Press the down-arrow key to advance to row 11
<u>ET Neale's Meals<return></u>	Enter the Text
<u>FR 2<return></u>	Format Row 11 to 2 decimal places
<u><down-arrow></u>	Press the down-arrow key to advance to row 1111111111
<u>ET 11111111111111111111<return></u>	Enter a string of 19 1's
<u>WA 11<return></u>	Set the Width of All columns to 11
<u><right-arrow></u>	Press the right-arrow key to advance to column 2
<u>EL 1<return></u>	Enter a Line of 1's from the column 2 to the last column. Note: This is another way to write multiple lines of text. Entering 11 1's and then using <control-L>'s could have also been used.
<u>WA 12<return></u>	Set the Width of All columns to 12
<u>W . 20<return></u>	Set the Width of the current (.) column to 20
<u><down-arrow></u>	Press the down-arrow key to advance to row TOTALS
<u>ET TOTALS:<return></u>	Enter the Text
<u>FR \$2<return></u>	Format Row TOTALS with dollar signs and to 2 decimal places
<u><down-arrow></u>	Press the down-arrow key
<u><down-arrow></u>	Press the down-arrow key again to advance to row Change
<u>ET Change:<return></u>	Enter the Text
<u>FR \$2<return></u>	Format Row Changes with dollar signs and to 2 decimal places

<u>You</u>	<u>Explanation</u>
<u><down-arrow></u>	Press the down-arrow key to advance to row %Change
<u>ET %Change:<return></u>	Enter the Text
<u>FR %2<return></u>	Format Row %Change to be in percent to 2 decimal places. Note: The FA in conjunction with FR's could have been used for formatting.

Enter The Formulas

Now position the cursor at [1,5]

EFM SUM([.,2],[.,4]) 11 1<return>

Enter the Formula in Multiple for 11 rows and 1 column starting at the current cursor position. The formula for Fiscal YTD is the sum (SUM) of the current row, column 2 ([.,2]) to the current row, column 4 ([.,4]). Enter this formula for 11 rows on this column.

<right-arrow>

Press the right-arrow key to advance to column 6

EFM AVG([.,2],[.,4])*1.1 11 1

Enter the Formula in Multiple for 11 rows and 1 column starting at the current cursor position. The formula for April Proj. is the average (AVG) from the current row, column 2 ([.,2]) to the current row, column 4 ([.,4]) times (*) 1.1.

JR TOTALS<return>

Jump to Row TOTALS

JC 2<return>

Jump to Column 2

You are now at position [TOTALS,2]

<u>You</u>	<u>Explanation</u>
<u>EFM SUM([1,.],[.2,.]) 1 5<return></u>	Enter the Formula in Multiple for 1 row and 5 columns starting at the current cursor position. The formula for the TOTALS is the sum (SUM) of row 1, current column ([1,.]) to 2 rows above the formula, current column ([.2,.]) for 6 columns on this row. Note: There are many ways to write this formula, but this method allows the user to increase the size of the array (SS) and insert another company name (OR) without having to change the formula.
Position the cursor at [TOTALS,3] <u>EF <control-A> <left-arrow> <control-A></u> <u><down-arrow> <down-arrow> <right-arrow> <return></u>	Enter the Formula that is this months total less last months total. Position the cursor at [TOTALS,3] and pick up the address of this months total (<control-A>), less (-), position cursor at [TOTALS,2] and pick up the address of last months total (<control-A>) and then position the cursor where the result belongs, [Change,3], and enter the formula <return>. Note: The entire EF command line is on one physical line.
Position the cursor at [TOTALS,4] <u>EF <control-A> <left-arrow> <control-A></u> <u><down-arrow> <down-arrow> <right-arrow> <return></u>	Enter the Formula + see the above explanation
Position the cursor at [Change,3] <u>EF <control-A> / <up-arrow> <up-arrow> <left-arrow> <control-A></u> <u><down-arrow> <down-arrow> <down-arrow> <right-arrow> <return></u>	Enter the Formula that is this months change divided by last months total. Position the cursor at [Change,3] and pick up the address of this months change (<control-A>), divide by (/), position the cursor at [TOTALS,2] and pick up the address of last months total (<control-A>) and then position the cursor where the result belongs, [%Change,3], and enter the formula <return>. Note: The entire EF command line is on one physical line.

<u>You</u>	<u>Explanation</u>
------------	--------------------

Position the cursor at [Change,4]

<u>EF <control-A>/<up-arrow><up-arrow><left-arrow><control-A></u> <u><down-arrow><down-arrow><down-arrow><right-arrow><return></u>	Enter the Formula - see the above explanation
---	---

<u>JB<return></u>	Jump to the Beginning
-------------------------	-----------------------

Saving

At this point, it is a good time to save the model. To update, the model with a new filename, type the following:

UN<return>

At this point you are prompted with the message:

Please enter NEW filename:

You may enter from 1 to 8 alpha-numeric characters. Try the following:

SAMPLE<return>

If you would like to update the file with the name shown on the upper right side of the screen, simply type U<return>. Note: You will erase the "old" model.

Once a model is "de-bugged", you may want to "write-protect" it. To do this, you must first update the model (U or UN), then exit ExecuPlan (QN) and then "write-protect" the file under CP/M by using STAT and the \$R/O option³.

³ See CP/M 2 Introduction to Features and Facilities Manual - STAT

Testing

After updating the model, it is a good idea to test it. Press the TAB key (tabulate) to obtain results (re-calculate). Jot down needed changes and then re-enter them. Be sure to test a wide range of data to ensure its correctness. For this sample, fill in the sales figures needed for each company name and the months January through March. To enter the data, position the cursor at the desired address, type the value and then press <return>. Press <tab> to re-calculate.

Example: 2.34<return>

DO NOT enter data where there is a formula. If you do, the formula will be cleared and you must re-enter it.

Printing

Before printing the array, you may want to change the default printer parameters. You have 5 "blocks" that you may alter. Listed below is a brief description of each block.

<u>Block</u>	<u>Description</u>
0	Set titles to be left (L) or right (R) justified, centered (C) or do not print them (X).
1	Set the printing bounds by specifying the upper-left and the lower-right addresses.
2	Set the paper size
3	Print with or without column and/or row titles
4	Don't print specified rows and/or columns contained within the printing bounds

You may also "write" the report to the disk (D). The sample reports listed in Section 3 used this option and were incorporated into this manual through the use of Memorite III.

For this sample, type the following for printing the first report:

<u>You</u>	<u>Explanation</u>
The First Report	
<u>P</u> <return>	Enter the Printer sub-commands
<u>0</u>	Modify block 0
<u>C</u> <return>	Center main title 1
<u>C</u> <return>	Center main title 2
<u>X</u> <return>	Do not print main title 3
<u>C</u> <return>	Center main title 4
<u>3</u>	Modify block 3
<u>N</u> <return>	Do not print row titles
<u>N</u> <return>	Do not print column titles
<u>4</u>	Modify block 4

<u>You</u>	<u>Explanation</u>
<u>C<return>6<return></u>	Set Column 6 to be "invisible"
<u><esc></u>	Exit block 4
<u>P</u>	Start Printing
<u>F</u>	Advance the printer to top of Form

Now For The Second Report

<u>0</u>	Modify block 0
<u>X<return></u>	Do not print main title 1
<u>X<return></u>	Do not print main title 2
<u>C<return></u>	Center main title 3
<u><esc></u>	Exit block 0
<u>4</u>	Modify block 4
<u>C<return>5<return></u>	Set Column 5 to be "invisible"
<u><esc></u>	Exit block 4
<u>P</u>	Start Printing
<u>F</u>	Advance the printer to top of Form
<u><esc></u>	Exit the printer sub-command level

You now have printed both reports. At this point you may update (U or UN) the new model with the current printer parameters. Experiment with this model and try your own formulas and formats.

Note: With one model, more than one report may be generated. The sky (or your paper supply) is the limit!

SECTION 3

Distribution Disk

Included on the ExecuPlan distribution disk are system files and models. The system files are **EPL.COM** and **EPL.SYS**. These two files must reside on the same disk. Other files included on the disk are sample models. The following pages describes them in more detail.

Note:

Each of the reports included in this Primer were generated in ExecuPlan by using the print (P) command and then the write to disk (D) sub-command. They were then "inserted" into the text through the use of Vector's New Memorite III word processing system. The spelling (not grammar) was then verified through the use of Vector's New Spelling Module, a spelling verification and correction utility.

ForecastingFORECAST

The model whose filename is FORECAST is identical to the sample model described in Section 2. In order to invoke it from ExecuPlan, type the following:

D<return>

Position the cursor on the filename FORECAST

L

Y

<esc>

You may enter values and test the results by pressing the <tab> key and printing the reports.

The following displays sample reports before and after data was entered and re-calculated.

April Forecast
March 31, 1981

Company / Month	January	February	March	April Proj.
Bob's Auto Repair				\$0.00
Cory-O-Graphic				0.00
E. Dilks Inc.				0.00
Celic's Ceramics				0.00
Graphics by Ted				0.00
Livingston's Toys				0.00
Rasmussen's 5 & 10				0.00
Mark's Photo Shop				0.00
Wagner's Liquor				0.00
Zelma's Zoo				0.00
Neale's Meals				0.00
TOTALS:	\$0.00	\$0.00	\$0.00	\$0.00
Change:		\$0.00	\$0.00	
%Change:		0.00%	0.00%	

April Forecast
March 31, 1981

Company / Month	January	February	March	April Proj.
Bob's Auto Repair	\$123.12	\$145.23	\$192.38	\$168.93
Cory-O-Graphic	100.00	110.34	155.87	134.28
E. Dilks Inc.	89.00	95.46	102.42	105.19
Celic's Ceramics	34.12	42.54	32.14	39.89
Graphics by Ted	12.45	10.19	25.68	17.72
Livingston's Toys	129.34	256.34	182.51	208.34
Rasmussen's 5 & 10	89.34	118.62	155.74	133.36
Mark's Photo Shop	23.45	52.45	61.85	50.51
Wagner's Liquor	15.34	28.94	30.76	27.51
Zelma's Zoo	12.50	15.48	28.77	20.81
Neale's Meals	2.00	3.00	4.00	3.30
TOTALS:	\$630.66	\$878.59	\$972.12	\$909.84
Change:		\$247.93	\$93.53	
%Change:		39.31%	10.65%	

Binomial ExpansionBINOMIAL

BINOMIAL performs the binomial expansion (Pascal's Triangle) of a number. To use it, type the following:

D<return>

Position the cursor on the filename **BINOMIAL**

L

Y

<esc>

1<return>

<tab>

Creation of the model involved the following steps:

- Set the size to 9 rows by 17 columns (SS)
- Change the column titles to range from -8 to 8 (TC)
- Open 2 rows before 1 (OR)
- Enter instructions on the first line (ET)
- Enter the multiple formula $[.-1,.-1]+[.-1,.+1]$ for 7 rows and 17 columns (EFM)
- Clear some of the formulas to get the triangle effect. (C)
- Format the entire array to be integer (FA 0)
- Update the model with the cursor at the top of the triangle (UN, or U)

The following page shows a print-out of the binomial expansion before and after entering values.

The Binomial Expansion of a Number														
ExecuPlan														
Vector Graphic Inc.														
-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Please enter a number below and then hit the TAB key.														
						0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Please enter a number below and then hit the TAB key.														
						1	1	1	1	1	1	1	1	1
			1	1	1	3	6	10	15	21	28	36	45	55
1	1	1	6	5	15	10	20	15	10	6	3	1	1	1
1	1	7	6	21	15	35	20	35	15	21	6	7	1	1

Real Estate

PROPDATA and RENTAL are two models relating to the real estate market. As the file names suggest, PROPDATA maintains data on a piece of property and RENTAL maintains costs of a piece of rental property.

PROPDATA

To use PROPDATA, type the following:

D<return>

Position the cursor on the filename PROPDATA

L

Y

<esc>

And then enter the required data

Creation of this model did not involve complicated formulas. Most of the time was spent in formatting the information. The following lists the major steps involved:

- ~ Set the size of the array (SS)
- Change the columns titles (TC)
- Open 6 rows at the top and three in the middle (OR)
- Enter all of the cosmetics - underlines and text (ET)
- Enter the formulas ~ SUM, division and subtraction by using the <control-A> key (EF)
- ~ Format all of the rows and columns (FR, FC and F)
- ~ Position the cursor next to the Date and update the model (UN or U)

Listed on the following pages are the reports generated by PROPDATA.

Before entering the data:

Annual Property Operating Data
 ExecuPlan
 Vector Graphic Inc.

Date			
Purpose			
Name			
Location			
Type			
Values	Assessed/Appraised		
1	Land		0.00%
2	Improvement		0.00%
3	Personal Property		0.00%
4	Total	\$0.00	0.00%

5			
6	Adjusted Basis as of:		
7			
8	Price		
9	Loans		
10	Equity	\$0.00	
11			

Finance	FINANCING	Balance	Payment	Period	Interest %
12	Existing:				%
13		1st			%
14		2nd			%
15		3rd			%
16					
17	Potential:				%
18		1st			%
19		2nd			%

After entering the data and re-calculating:

Annual Property Operating Data
ExecuPlan
Vector Graphic Inc.

Date December 1, 1980
 Purpose Rental
 Name A.B.C. Company
 Location Any Town, U.S.A.
 Type Commercial C-3
 Values Assessed/Appraised

1	Land	\$200,000.00	12.38%
2	Improvement	\$1,400,000.00	86.68%
3	Personal Property	\$15,100.00	0.93%
4	Total	\$1,615,100.00	100.00%

5
 6 Adjusted Basis as of:
 7
 8 Price \$4,000,000.00
 9 Loans \$1,800,000.00
 10 Equity \$2,200,000.00
 11

Finance	FINANCING	Balance	Payment	Period	Interest %
12	Existing:	\$1,000,000.00			%
13		1st \$500,000.00			%
14		2nd \$300,000.00			%
15		3rd \$0.00			%
16					
17	Potential:				
18		1st \$1,000,000.00			%
19		2nd \$500,000.00			%

RENTAL

Like PROPDATA, RENTAL involves a lot of cosmetics, and very little math. The following steps outline the creation of this model:

- Set the Size (SS)
- Open 2 rows titled By: and ===== (OR)
- Change the column titles (TC)
- Enter the long list of text (ET)
- Fill in the sections that do not require data with -'s (EL)
- Create the formulas ▸ SUM, ▸, +, and / for percent calculations (EF)
- Format the columns (FC)
- Position the cursor next to By: and update the model (UN or U)

The following pages illustrate the reports that can be generated by this model.

Before entering data:

Annual Property Operating Costs
 Rental Income
 Vector Graphic Inc.
 ExecuPlan

Prepared	2	3	8
GROSS SCHEDULED RENTAL INCOME			0.0%
Plus: Other Income			0.0%
TOTAL GROSS INCOME		0.00	0.0%
Less: Vacancy and Credit Losses			0.0%
GROSS OPERATING INCOME		0.00	0.0%
Less: Operating Expenses			
Accounting and Legal			0.0%
Advertising, Licenses and Permits			0.0%
Property Insurance			0.0%
Property Management			0.0%
Payroll - Resident Management			0.0%
Other			0.0%
Taxes-Workmen's Compensation			0.0%
Personal Property Taxes			0.0%
Real Estate Taxes			0.0%
Repairs and Maintenance			0.0%
Services - Elevator			0.0%
Janitorial			0.0%
Lawn			0.0%
Pool			0.0%
Rubbish			0.0%
Other			0.0%
Supplies			0.0%
Utilities - Electricity			0.0%
Gas and Oil			0.0%
Sewer and Water			0.0%
Telephone			0.0%
Other			0.0%
Miscellaneous			0.0%
TOTAL OPERATING EXPENSES	0.00		0.0%
NET OPERATING INCOME		0.00	0.0%
Less: Total Annual Debt Service			
CASH FLOW BEFORE TAXES		0.00	

After entering data and re-calculating

Annual Property Operating Costs
 Rental Income
 Vector Graphic Inc.
 ExecuPlan

Prepared A.B.C. Company	2	3	8
GROSS SCHEDULED RENTAL INCOME	8400.00		96.6%
Plus: Other Income	300.00		3.4%
TOTAL GROSS INCOME	8700.00		100.0%
Less: Vacancy and Credit Losses	0.00		0.0%
GROSS OPERATING INCOME	8700.00		100.0%
Less: Operating Expenses			
Accounting and Legal	0.00		0.0%
Advertising, Licenses and Permits	15.15		0.2%
Property Insurance	1824.00		21.0%
Property Management	0.00		0.0%
Payroll - Resident Management	0.00		0.0%
Other	0.00		0.0%
Taxes-Workmen's Compensation	0.00		0.0%
Personal Property Taxes	0.00		0.0%
Real Estate Taxes	552.00		6.3%
Repairs and Maintenance	350.12		4.0%
Services - Elevator	0.00		0.0%
Janitorial	150.00		1.7%
Lawn	600.00		6.9%
Pool	150.00		1.7%
Rubbish	75.00		0.9%
Other	125.00		1.4%
Supplies	0.00		0.0%
Utilities - Electricity	0.00		0.0%
Gas and Oil	0.00		0.0%
Sewer and Water	180.00		2.1%
Telephone	0.00		0.0%
Other	0.00		0.0%
Miscellaneous	0.00		0.0%
	0.00		0.0%
TOTAL OPERATING EXPENSES	4021.27		46.2%
NET OPERATING INCOME	4678.73		53.8%
Less: Total Annual Debt Service	2652.00		
CASH FLOW BEFORE TAXES	2026.73		

Loans

There are two models that address the financial end of business. They are the calculations of the monthly payment of an amortized loan and the schedule of payments of an amortized loan. The formulas for these models were taken from commonly used financial books.

AMORITIZ

The following describes the creation of the model:

- Set the size (SS)
- Change the titles (TC and TR)
- Make the first column with a width of 64. This causes a full screen of information to be scrolled in at one time. Also set the other widths (W)
- Write in the first "big" paragraph of information. The command line editor was used extensively to get the centered effect (ET)
- Fill in the cosmetics for the "second" screen (ET)
- Enter the formulas. Note: One of the formulas was too long to enter on one command line, so the calculation for the amortization was done in stages. The first calculation was placed on the last column and it is "off" the second screen. This was done, so that the intermediate calculation does not show to the user. The user is only interested in the results, not the "scratch pad" area. By setting the last column to a width of 64, it is off the screen yet still there. (EF)
- Set the calculate order to be row first (SC R)
- Position the cursor on the first column and row labeled Loan and update the model (UN or U)

The following reports can be generated.

Before entering data:

Equal Monthly Loan Amortization Payments

ExecuPlan
Vector Graphic Inc.

Loan
%Rate % per year
Years

Results Press the TAB (tabulate) for the results

Rate= 0.00% per month
Total= 0 payments

Payment= 0.00 per month

After entering data and re-calculating:

Equal Monthly Loan Amortization Payments

ExecuPlan
Vector Graphic Inc.

Loan 30500.00
%Rate 7.75 % per year
Years 29

Results Press the TAB (tabulate) for the results

Rate= 0.65% per month
Total= 348 payments

Payment= 220.44 per month

PAYMENTS

PAYMENTS lists the schedule of payments for a given amortized loan. This model also includes ExecuPlan sales information. Feel free to "browse" through this model. The creation of this model was a little more involved than the previous because of the additional sales information, but the "skeletal" model is basically the same. Some of the differences include a larger "scratch pad" area that is used for intermediate calculations and the use of varying column widths to get the "paging" effect. If you would like to copy this model without the added sales information, try using with caution the kill column (KC) and then re-set the array size (SS) command. Make sure that this is done only to those rows and columns that are not referenced. The following page lists a report generated after entering data..

Schedule of Payments
ExecuPlan
Vector Graphic Inc.

Loan: 30500.00
Rate: 7.75 %
Payment: 221.00 monthly

Payment Number	Principle Amount	Interest Amount	Total Principle	Balance Due	Total Interest	Total Payment
25	28.03	192.97	649.44	29850.56	4875.56	5525.00
26	28.22	192.78	677.65	29822.35	5068.35	5746.00
27	28.40	192.60	706.05	29793.95	5260.95	5967.00
28	28.58	192.42	734.63	29765.37	5453.37	6188.00
29	28.77	192.23	763.39	29736.61	5645.61	6409.00
30	28.95	192.05	792.35	29707.65	5837.65	6630.00
31	29.14	191.86	821.48	29678.52	6029.52	6851.00
32	29.33	191.67	850.81	29649.19	6221.19	7072.00
33	29.52	191.48	880.32	29619.68	6412.68	7293.00
34	29.71	191.29	910.03	29589.97	6603.97	7514.00
35	29.90	191.10	939.93	29560.07	6795.07	7735.00
36	30.09	190.91	970.02	29529.98	6985.98	7956.00
37	30.29	190.71	1000.30	29499.70	7176.70	8177.00
38	30.48	190.52	1030.78	29469.22	7367.22	8398.00
39	30.68	190.32	1061.46	29438.54	7557.54	8619.00
40	30.88	190.12	1092.34	29407.66	7747.66	8840.00
41	31.08	189.92	1123.41	29376.59	7937.59	9061.00
42	31.28	189.72	1154.69	29345.31	8127.31	9282.00
43	31.48	189.52	1186.17	29313.83	8316.83	9503.00
44	31.68	189.32	1217.85	29282.15	8506.15	9724.00
45	31.89	189.11	1249.73	29250.27	8695.27	9945.00
46	32.09	188.91	1281.82	29218.18	8884.18	10166.00
47	32.30	188.70	1314.12	29185.88	9072.88	10387.00
48	32.51	188.49	1346.63	29153.37	9261.37	10608.00

Error Analysis

ERRORANL

The error analysis sample is similar to PAYMENTS because it too contains sales information, although the basic application performs the standard deviation. Since this example was taken from a text book⁴, it is suggested that the user refer to that book for a more detailed explanation of the calculations. Contained in the model, the user will find a method to round a decimal fraction by using the INT function.

The following pages list the tables and the calculated values. (Note: It might be of interest to the user that an error was found in the text book!)

It is left as a challenge to the user to substitute these calculations with the built in standard deviation (SD) function. (Reminiscent of a calculus proof - Eh?)

⁴ Y. Beers, Introduction to the Theory of Error. 2nd ed. Massachusetts: Addison-Wesley Publishing Company, Inc., 1957

Error Analysis
 from Theory of Error by Yardley Beers
 ExecuPlan
 Vector Graphic Inc.

x	Number of occurrences	mxc
1.01	1	1.01
1.02	3	3.06
1.03	6	6.18
1.04	8	8.32
1.05	10	10.50
1.06	7	7.42
1.07	8	8.56
1.08	4	4.32
1.09	3	3.27
1.10	0	0.00
1.11	1	1.11

Total number of occurrences = 51

Total of mxc (column 3) = 53.75

Average = 1.054422

Average rounded to three decimal places = 1.054

delta x = x - average(x)	Rounded to the nearest hundredth	m times the absolute(delta x)
-0.039	-0.04	0.04
-0.029	-0.03	0.09
-0.019	-0.02	0.12
-0.009	-0.01	0.08
0.001	0.00	0.00
0.011	0.01	0.07
0.021	0.02	0.16
0.031	0.03	0.12
0.041	0.04	0.12
0.051	0.05	0.00
0.061	0.06	0.06

*Error Analysis
from Theory of Error by Yardley Beers
ExecuPlan
Vector Graphic Inc.*

Calculating the average deviation yields the following:

0.0169

and rounded to the nearest thousandth gives the

Average deviation of:

0.017

The fractional average deviation is:

0.016

AnthropologyANTHRO

Imbedded in ANTHRO the user will see sales information like that in PAYMENTS and ERRORANL. This example shows how ExecuPlan can be used as an educational tool. The entire "exercise", including the history, explanations and calculations is contained in the model. Through the use of a variety of formats and column widths, a student may "page" through this experiment. This linear regression example is of particular interest to the anthropologist, but the calculations can be applied to a wide range of disciplines. For a more in depth explanation of the calculations, please refer to the text book⁵.

In order to use this model, type the following:

D<return>

L

Y

<esc>

<tab>

Position the cursor at [1,diameter]

4.75<return>

<tab>

The <tab> key was pressed twice in order to obtain the results. This is at times necessary when the results of one calculation are needed for the results of another, yet it has not been calculated. This could have been avoided if the rows were "paged" instead of the columns and the calculate order were set to be by column (SC C). The following pages are listings of this model.

⁵ D. H. Thomas, Figuring Anthropology. New York: Holt, Rinehart and Winston, 1976.

A Linear Regression Application in Anthropology
ExecuPlan
Vector Graphic

An Example of Linear Regression in Anthropology

While analyzing the archaeological findings at Fort Michilmackinac, Lewis Binford made the interesting observation that kaolin pipestems can be used to date historic archaeological sites. It seems that during the seventeenth and eighteenth centuries, the average diameter of these pipestems decreased in a remarkably consistent fashion. The relationship between site age and stem-bore diameter has been assembled in the next columns for the 12 colonial archaeological sites.

Site	Age A.D.	Pipestem Diameter
Ft. Michilmackinac Barracks	1775	4.07
Archer Cottage, Yorktown	1769	4.31
Ft. Necessity	1754	4.40
Ft. Michilmackinac	1768	4.55
Williamsburg (Coke Garret I)	1757	4.62
Spaulding's Lower Store	1770	4.63
Brunswick Town	1751	4.88
Ft. Frederica, Ga.	1743	4.91
Silver Bluff, S.C.	1748	4.91
Tutter's Neck, Va. (Pit A)	1706	5.82
Clay Bank	1695	6.11
Warrasqueoi	1688	6.50

From the pipestem diameters we wish to predict the age of an archaeological site. The method best suited for this derivation is called the Bartlett's Three-Group Method. It is basically a linear equation where the slope, b' is defined as:

$$b' = \frac{(\bar{y}_3) - (\bar{y}_1)}{(\bar{x}_3) - (\bar{x}_1)}$$

Where x_1 , y_1 and x_3 and y_3 represent the first and last third of the data presented.

A Linear Regression Application in Anthropology
 ExecuPlan
 Vector Graphic

Bartlett's Three-Group Method

~~~~~

And the y-intercept is given as:

$$a' = \bar{y} - b'\bar{x}$$

The resulting equation provides the "best fit" when both variables have been randomly sampled. The following example illustrates Bartlett's Three-Group Method of regression.

| (diameter)<br>x | (age)<br>y | x <sup>2</sup> | y <sup>2</sup> | xy       |
|-----------------|------------|----------------|----------------|----------|
| 4.07            | 1,775      | 16.56          | 3,150,619      | 7224.25  |
| 4.31            | 1,769      | 18.58          | 3,129,356      | 7624.39  |
| 4.40            | 1,754      | 19.36          | 3,076,512      | 7717.60  |
| 4.55            | 1,768      | 20.70          | 3,125,821      | 8044.40  |
| 4.62            | 1,757      | 21.34          | 3,087,048      | 8117.34  |
| 4.63            | 1,770      | 21.44          | 3,132,892      | 8195.10  |
| 4.88            | 1,751      | 23.81          | 3,065,999      | 8544.88  |
| 4.91            | 1,743      | 24.11          | 3,038,041      | 8558.13  |
| 4.91            | 1,748      | 24.11          | 3,055,503      | 8582.68  |
| 5.82            | 1,706      | 33.87          | 2,910,431      | 9928.92  |
| 6.11            | 1,695      | 37.33          | 2,873,022      | 10356.45 |
| 6.50            | 1,688      | 42.25          | 2,849,343      | 10972.00 |

The grand mean and group means must be computed:

$$\bar{x} = 4.98 \quad \bar{y} = 1743.67$$

$$\bar{x}_1 = 4.33 \quad \bar{y}_1 = 1766.50$$

$$\bar{x}_3 = 5.84 \quad \bar{y}_3 = 1709.25$$

$$b' = -.38.10$$

$$a' = 1933.26$$

Enter the diameter of the pipestem: 4.51

The estimated age of the site is A.D. 1761.42